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WHERE DO WE GO FROM HERE?[1]

JAMES T. GRIFFITHS
Lyons Fertilizer Co., Winter Haven

During the past two years I have had an opportunity to observe citrus insect control from an angle entirely new to me. These observations have placed me in a position where some soul-searching has been in order. I want to discuss these observations, point out some pertinent facts, and attempt in a small way at least to direct our thinking along slightly different lines than many of us have pursued in the past. While my remarks will be confined to citrus, I believe that citrus may well serve as an example for some crops grown under other circumstanes.

Today, the citrus industry is in the position of having one or more chemicals available for the control of all our citrus insects and mites. The power sprayers which are available are capable of giving thorough and adequate coverage. Savings are being affected by the use of concentrated sprays. I wish to begin my discussion by raising two questions. What is the most economical way to control citrus pests? Is it possible that when applying sulfur we spray too thoroughly and use too much material?

One point should always be foremost. Insect or mite control must be judged not by the cost per box, but in the final analysis, by the growers' net profits. The cost of an individual application is not the important one, but, rather, the cost of the program for the year, as compared with the results obtained.

SPRAY VS. NO SPRAY

There are four major topics which I wish to discuss. The first one is concerned with the type of results obtained from complete spray programs when compared with no sprays or dusts at all. Accurate comparisons are difficult, if not impossible, to attain in commercial operations. The grower who reduces his spray program usually reduces his fertilizer program, and, thus, results are not comparable. Since about 1940, there have been two unsprayed plots of grapefruit at the Citrus Experiment Station at Lake Alfred. Up to two years ago these

[1] Presidential address delivered before the annual meeting of the Florida Entomological Society on September 10, 1953, at Miami, Florida.

trees had produced at least one-half box per tree per year more than the supposedly properly sprayed trees about them. When this became known to me in 1947, I set up two experiments to determine if this phenomenon was real. The first four years of these experiments were reported by Griffiths & Thompson. Unfortunately, the trees were not uniform in one experiment, and the smallest trees in the grove made up the untreated plots. Here, actual yields were less, but trends were identical. That is, sprayed and unsprayed tree yields increased or decreased in approximately the same proportion each year. In the second experiment, trees were uniform and yields from the unsprayed plots were just as good or better than from the completely sprayed ones.

Similar experiments on oranges have run fewer years and are not as conclusive, but the trends on yields are similar.

There has been a definite difference in tree condition between the two sets of plots. The unsprayed trees have usually defoliated in the winter as the result of greasy spot. In spite of this, evidence that total yields were affected is not present. However, it is probable that the defoliation resulted in more late bloom fruit.

So far as insects were concerned, scales were never a major problem in the unsprayed plots, and there were actually fewer purple and red scales on the unsprayed fruit at picking time than on fruit where sprays had been applied.

Purple mites were no problem where they were not controlled, but six spotted mites caused injury in some years.

Internal quality was not reduced by eliminating all sprays and dusts. In fact, solids were usually better from the unsprayed plots.

I do not mean to stand here today and suggest that the elimination of all sprays and dusts is either desirable or practical, although this may be the case. I do believe that the results obtained in these plots cast some doubt upon the hypothesis that the use of sprays and dusts necessarily increase yields on citrus in Florida.

SPRAY RESIDUES

Much has been said and written concerning the effects of spray and dust residues on citrus. In collaboration with Fisher (1950a, 1950b) and Thompson (1950), I have had opportunity to study several aspects of this problem. Results of these experiments and general observations have led me to these con-

clusions. Pound for pound of residue, copper and zinc result in greater insect and mite increases than sulfur. In actual grove practice the frequency of sulfur application causes greater increases of both scales and purple mites. There can be little doubt that the regular and intensive use of sulfur is a major factor in the increased insect and mite problems following these applications.

It is probable that every time a spray or dust is applied some undesirable results are obtained, because of a reduction in the effectiveness of the biological checks on pest populations. From the standpoint of biological control it appears to be desirable to work toward reduced spray programs, but the elimination of zinc and copper by many growers has produced very little effect upon the necessity for insect and mite control. This emphasizes the fact that sulfur is often a major cause of later excessive insect and mite infestations. This raises a question which needs considerable study before an adequate answer is found. How much sulfur is necessary?

DUSTING VS. SPRAYING

In 1952, Griffiths, Stearns, and Thompson summarized three years results when dusts were compared with sprays for the application of sulfur. In this work, relatively ideal dusting conditions were attained. Although the trees involved would usually have been thought of as 15 gallon trees, only 10 gallons, or 1 pound of sulfur per tree, were applied in most instances. Minimal amounts were used in an effort to demonstrate differences in the methods of application. However, there was no practical difference, in terms of fruit grade, between the two methods of application, but more scales were present on fruit from the sprayed plots.

Another factor which was discussed very little in the original paper dealt with differences in speed of the machines at the time of application. Although comparisons of speed were made in at least six instances, differences in rust mite control could not be demonstrated.

I believe we will all agree that dusting is less thorough and is more apt to result in failure. In spite of this, there are many groves in the state that are dusted only two or three times a year and rarely, if ever, have a scalicide applied. These groves usually escape with little or no rust mite injury.

Similarly, if one goes into some of the old citrus producing areas of the state, it may be readily noted that the growers use low gallonage per tree, spray less often, and use boom type sprayers at relatively rapid speeds. In spite of this, these growers produce excellent quality fruit that is most acceptable in fresh fruit channels. These facts suggest that it may be possible and desirable to minimize the use of sulfur in all groves on the basis of insect and mite control.

GREASY SPOT AND DEFOLIATION

During the past two winters, groves, particularly in the Ridge Section, have suffered very severe defoliation. While purple mites may have been a factor in some instances, the primary cause associated with the defoliation was greasy spot (Thompson, 1948). I fully realize that many growers and some production men still insist that rust mites are not the cause of this condition. In my own experience I have yet to find greasy spot a problem in any grove when rust mites were never allowed to reach infestations higher than 15-25% of the fruit infested. Other insects and mites can cause greasy spot, and it is always possible that some mite, associated with rust mites, and also controlled by sulfur is the real culprit, but this theory is certainly open to question.

I wholeheartedly agree that there is more to greasy spot than just rust mite feeding. Tanaka and Yamada, Japanese workers, described a similar condition and claimed that it was caused by a fungus which entered at the site of the stomata. Miss Fran Fisher has been working along this line in Florida. I have seen numerous instances where a great many rust mites produced little or no injury to fruit or greasy spot on foliage. Similarly, there are many cases where injury is severe, and only a relatively few mites were present. I will venture an opinion here, that before all is said and done, it will be shown that greasy spot and fruit injury are only indirectly caused by rust mite feeding and that the real cause is a secondary invader such as a fungus, bacterium, or the like. Further, I strongly suspect that the stomata are more closely associated with late rust mite injury to fruit than are the oil cells.

In any case, greasy spot defoliation as it has appeared in the field is often associated with small leaves in the tops of the tree and a failure of the tree to produce satisfactory growth in the top. One school of thought has held that this is simply a

failure to get good coverage with sprays. At the present time I cannot agree with this.

I could name several caretakers who are notorious for poor spray jobs, but who have had few greasy spot troubles. On the other hand, some of the worst affected groves have been on good spray programs, and coverage has been as good as can be obtained with present day equipment.

In this connection I would like to cite another example. Last winter, in a grapefruit grove where trees were being cut off for top working, I made the following observations. These trees had not been sprayed or dusted with sulfur since the preceding June, but rust mites had been common throughout most of the summer and fall. Although there was practically no greasy spot at the bottom of the tree, the tops had a fair amount. This certainly suggests here that the differential should not be attributed to spray coverage.

As I have outlined above, we are faced with certain incontrovertible facts:

1. Citrus can be raised without sprays or dusts and it will be a satisfactory product for cannery use.

2. Almost all insecticides, fungicides, and nutritional sprays adversely affect insect and mite control. Of these, sulfur is the major offender in actual practice.

3. Many growers are obtaining good results in the field with minimal amounts of sulfur and often with relatively poor coverage.

4. In spite of an effort to do a good job by some growers in the Ridge Area, greasy spot is a very real problem to them. It is so real that it sometimes appears that excessive spray is more a factor than inadequate coverage.

There is a spectre which haunts my dreams. It is that some day we will be spraying here as they do in California. They have excellent spray machines, use insecticides early and often, and have more bug troubles than ever before. Is it not possible that we may be going in the same direction? Certainly, I believe in progress, but progress for citrus is measured by more boxes of better quality fruit. If this can be accomplished by decreasing the use of some spray materials, that is real progress.

I once preached long and loud that thorough and heavy applications of sulfur were more desirable. I am now sitting down to a repast of untastey crow and suggesting that this was wrong. I believe that the problem of adequacy should be thor-

oughly explored and I suggest that we may well find that a little sulfur goes a long way, and that it need not be applied as carefully as we have previously believed.

If this theory proves sound, we are on the threshold of some interesting possibilities. I have long advocated a close tie-in between chemical control measures and applied ecology and biological control. By expanding studies in these fields it may be possible to curtail some other spray costs. Similarly, cooperation between the pathologist, horticulturist, and entomologist can lead in the same direction.

The ideas which I present today have been formulating over the last several years. I sincerely believe we should re-examine and re-appraise our present situation. Not more and more spraying, but more intelligent spraying will be an answer to our problems. We have the insecticides and the spray equipment. We need to know for sure how much material to use per tree; how often it should be applied; and how well it should be dispersed over the trees.

There will still be large quantities of insecticides to sell, but a more judicious application will benefit the grower and, in turn, his spray material supplier. What is good for the grower is good for all of us!

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EUTETRANYCHUS BANKSI (McG.) RECENTLY FOUND ON CITRUS IN FLORIDA (ACARINA: TETRANYCHIDAE)[1]

MARTIN H. MUMA, HAROLD HOLTZBERG and ROBERT M. PRATT
University of Florida, Citrus Experiment Station, Lake Alfred

In November, 1951, a series of specimens of this unusual spider mite was collected from a moderately infested orange grove one mile east of Scottsmoor, Florida, in Brevard County. As *Eutetranychus banksi* (McG.), 1914, was known previously only from castor bean and velvet bean, the species was tentatively identified by the senior author as *E. clarki* (McG.), 1935, and specimens were sent to Dr. E. W. Baker of the United States National Museum for confirmation. Dr. Baker identified the species as *E. banksi* (McG.) and stated in correspondence that *banksi* and *clarki* appeared to be the same species with the dorsal setal pattern being quite variable. As *E. mexicanus* (McG.), 1950, was segregated from *clarki* by McGregor primarily on the basis of dorsal setal variation it appears that all three names must be considered synonymous. *Eutetranychus banksi* (McG.) is the older name and therefore should be used for this variable, widely distributed species. McGregor (1935) established the common name "Texas citrus mite" for *clarki* which probably should be retained for *banksi* because of the common occurrence and economic importance of this species in Texas, Mexico and Costa Rica.

In making the above synonymic analyses several hundred specimens were examined. Material representative of *E. banksi* (McG.) was collected by the authors from citrus in two areas in Florida. Specimens representative of *E. clarki* (McG.) and *E. mexicanus* McG. were collected by Dr. A. F. Camp from citrus in Costa Rica. All specimens were mounted in Hoyer's modified Berlese solution for microscopic examination.

Taxonomic descriptions of the species have been published by McGregor (1914, 1935 and 1950). A good general description of the living mites was given by Dean (1952). The eggs of the species are flat and disc-like with a fine, rolled rim or edge as shown in figure 1. They vary in color from light yellow when laid through tan and green to reddish-brown just prior to hatching. Newly hatched larvae are light yellow to tan with pale legs. Nymphs, except for size, appear much like the adult females in form and color. Adult females are slightly larger

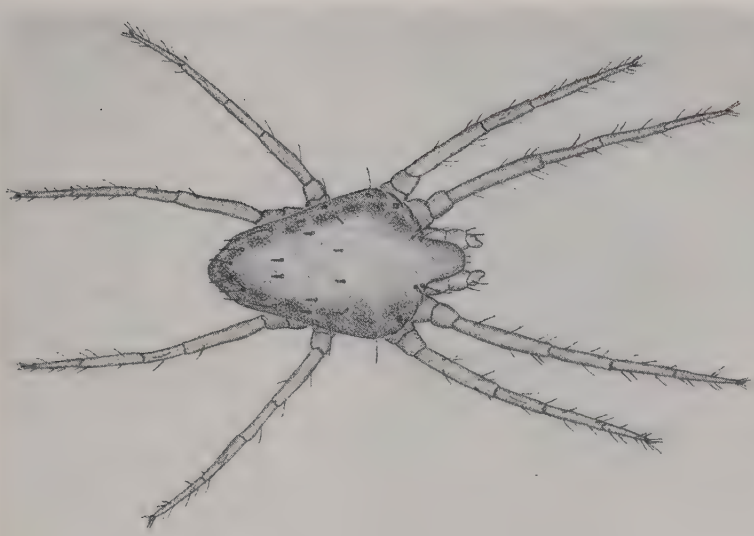
[1] Florida Agricultural Experiment Station Journal Series, No. 177.

than adult female citrus red mites, *Metatetranychus citri* (McG.). They are broad, robust and flattened with moderately strong legs as shown in figure 2. Coloration is a variable tan to brownish-green with dark brown to greenish spots and bars near the lateral margins. The legs are pale with the basal segments tan to brown. Adult males have the body triangular in outline, as shown in figure 3, and smaller than that of the female with the legs somewhat longer. Males vary in coloration from tan to light brown with darker, greenish spots and bars on the lateral margins of the body. The legs are light tan.

The type locality of the species is Orlando, Florida, where it was collected from castor bean and velvet bean. It has since been taken on chinaberry trees at Tampa by L. Carl Knorr and on citrus by the authors in two areas in the state. Infestations on citrus seem to be localized in the Turnbull Hammock area between Scottsmoor and Titusville in Brevard County and west of DeLand in Volusia County. Only one grove outside of these areas, a few miles southwest of Titusville, is known at the present time to be infested with the mite.

No detailed biological studies have been made on the species in Florida. Observations and grove records indicate that the biology is similar to that of the citrus red mite. Populations of mites are much heavier on the upper surfaces of the leaves and somewhat heavier on the sunny sides of the trees. Eggs are laid predominantly along the midrib and near the lateral margins of the leaves. Males rest beside nymphs that are in the process of moulting to mature females. Seasonal populations have been recorded in an unsprayed grove since January, 1952. Population peaks in this grove have been recorded during the fall and winter with the lowest populations occurring in the late spring and summer. At no time, however, have more than 24 percent of sampled leaves been found infested. On June 27, 1952, however, a survey trip to Turnbull Hammock revealed moderate to very heavy infestations in two sprayed groves. A similar survey of the DeLand area on May 20, 1953, revealed a very heavy infestation in a grove on a sulfur dust program. Leaf injuries caused by the citrus red mite and Texas citrus mite are macroscopically and microscopically identical. Owing to the similarity of injury, economically important infestations of the Texas cit-

Figure 1. Eggs of the Texas citrus mite.
Figure 2. Adult female Texas citrus mite.
Figure 3. Adult male Texas citrus mite.



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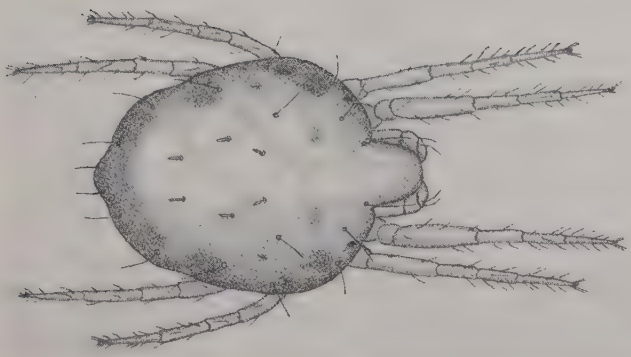

rus mite have been mistaken for the citrus red mite by growers in the infested areas.

No chemical or biological control data have been accumulated for this mite under Florida conditions. In Texas, sulfur dust has been reported to give good control (McGregor, 1935). Recently, control tests conducted by Dean (1952) in Texas have shown that processed sulfur dusts under grove conditions are as effective as dusts or sprays containing parathion, Ovotran, Neotran, DN-111, Aramite or Sulphenone. Dean also reported several predatory mites feeding on the Texas citrus mite in Texas. In Florida several species of *Typhlodromus* have been observed on leaves infested with the mite but no feeding by these predatory mites has been recorded.

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NEW MAYFLY RECORDS FROM FLORIDA AND A DESCRIPTION OF A NEW SPECIES[1]

LEWIS BERNER
Department of Biology, University of Florida

In 1927 Dr. James G. Needham, while collecting mayflies in Florida, picked up some nymphs which were described by Traver (1937) as *Oreianthus* sp. No. 1. At that time Dr. Traver indicated that the differences noted between these nymphs and those of *Oreianthus purpureus* Traver might be generic rather than specific, especially since the nymph of *Neoephemera*, a closely allied genus was not known. Burks (1953), after studying specimens of both *Oreianthus* and *Neoephemera*, concluded that the characters used to separate the two groups were not generic and he synonymized them. At the same time he indicated that the nymphs called *Oreianthus* sp. No. 1 by Traver and by Berner (1950) were *purpureus* and that the species ranged from Florida to North Carolina. I do not, however, agree that Traver's nymph is the same as that of *purpureus*, and the adults which have now been reared bear out my conclusion. The adults are also distinct from those of *Neoephemera bicolor* McDunnough, and I am therefore describing them as a new species.

Although I have collected nymphs of this new species on many occasions, and have transported them from northwest Florida back to Gainesville alive, it was not until 1951 that I was successful in rearing specimens to maturity. Again in 1953, I succeeded in rearing a few additional adults.

The immatures of *Neoephemera youngi* have been described very adequately by Traver and the ecology and habits were treated in "The Mayflies of Florida" (Berner, 1950). There is also an illustration of the nymph in the latter publication.

Neoephemera youngi n. sp.[2]

(*Oreianthus* sp. no. 1 Traver, 1937)

Adult males of *N. youngi* may be separated from those of *N. bicolor* by the abdominal coloration, the presence of a purplish

[1] Research supported in part by a grant from the U. S. National Park Service.

[2] I take pleasure in naming this species for Dr. Frank N. Young, Indiana University.

band in the distal four-fifths of the femur of *youngi*, and by the annulations on the caudal filaments of *youngi*. From *purpureus*, it may be separated by its smaller size, and by the difference in number of cross veins attaching the first anal vein to the hind margin of the fore wing. *N. youngi* also bears a small, dorsally-projecting, median spine on tergite 2. Neither of the other species appears to show this character.

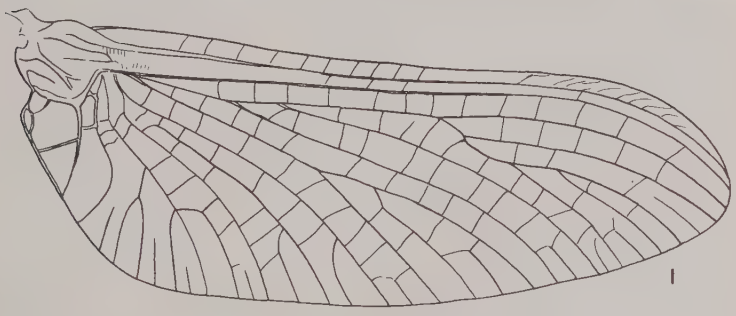
MALE HOLOTYPE: Body length 7.4 mm.; mesothoracic wings 8.1 mm.; outer caudal filaments 8.1 mm.; median caudal filament 8.5 mm.

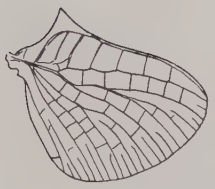
Head: Eyes large, separated dorsally by a distance about equal to one-half the width of one of the compound eyes. Vertex light in color, white bordering the eyes, orange brown in median section. Ocelli large, surrounded by a dark-brown band which runs between and around the ocelli and meets the median side of the compound eyes. Compound eyes purplish brown, the lower section blackish; upper section very large. Basal segment of antenna brown, flagellum brownish.

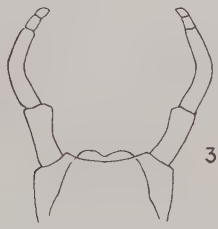
Thorax: Reddish brown. Pronotum yellowish brown in median area; dark, purplish-brown border along lateral margins and extending along the posterior border for a short distance medially. Mesonotum tan in color with indication of a fine, mid-dorsal, brownish line. Metanotum rather dark. Pleura darker brown than notum, with some reddish-brown coloration posterior to the middle legs. Sternum brownish; prosternum purplish brown between bases of fore legs. Anterior part of mesosternum with a large, blackish, median area, remainder somewhat splotched in coloration. Metasternum with blackish coloration in mid-line and similar speckled appearance of the mesosternum. Legs: Yellowish. Fore femur without markings except in distal portion where there is a purplish band in the outer four-fifths; tibia smoky, tarsus also smoky but somewhat darker than tibia; 1st tarsal segment relatively small, 2nd and 3rd approximately equal; tibia and tarsus nearly equal in length. Coxae of middle and hind legs with a purplish-brown spot near base on the outer side; femora colored same as fore leg with purplish band in distal four-fifths, tibiae and tarsi smoky. Wings: Main veins of costal border with purplish shading, other veins colorless. No distinctive markings in wings. Single cross vein attaching 1st anal vein to hind margin of wing (figure 1). Hind wings with very acute angle at the costal margin (figure 2).

Abdomen: Yellowish in mid-section of dorsum. Abdominal segments 1, 3, 4, and 5 with triangles in the postero-lateral corners of each tergite. The triangles begin at the antero-lateral portion of each segment, cover the entire lateral portions and extend inward along the posterior border almost to the median line. On segments 6-9, the purplish-brown areas become somewhat larger and more rectangular-shaped with the brownish coloration extending somewhat medially along the anterior margin of the tergite giving the rectangular appearance. Tergite 10 mostly yellowish with small brownish areas on the lateral borders. Tergite 2 almost completely yellow with only a faint indication of a dark mark at the postero-lateral corner. Small, dorsally-projecting, median spine at the posterior margin of tergite 2. In general, dorsal abdominal coloration shows an extensive pale color with the postero-lateral triangular areas gradually

encroaching upon the pale areas posteriorly. Sternites pale with a median, reddish-brown line extending from the anterior border almost to the posterior margin. This is a continuation of the median dark stripe present on the metasternum. Sternites 2-7 have a small black spot at the mid-posterior margin; 2-9 with a dark brown streak at the antero-lateral margins. Sternite 9 with a light orange coloration at the postero-lateral margin extending medially about half way to the mid line. Lateral margins of abdominal segments flanged, the flanges on segments 3-8 reflexed ventrally. Flanges of segment 9 much more pronounced than on other segments; purplish-brown, postero-lateral angles are produced to the posterior margin of segment 10. Genitalia pale and as shown in figure 3. Caudal filaments pale with purplish-brown annulations at alternate joinings.







Neoephemera youngi n. sp.
Figure 1. Fore wing of male.
Figure 2. Hind wing.
Figure 3. Male genitalia.

FEMALE ALLOTYPE: Body length 8.5 mm.; mesothoracic wings 9.8 mm.; outer caudal filaments 7.7 mm.; median caudal filament 9.3 mm.

Head: Eyes small, widely separated; ocelli large. Posterior margin, except in median area, bordered with a blackish-brown line. Median line of vertex with a thin, blackish stripe extending from posterior border about half way to front margin. Antennae brownish.

Thorax: Pronotum purplish brown with the margins heavily bordered with darker coloration; purplish median line. Mesonotum light brown with purplish shading laterially; fine, median line extending full length

of mesonotum. Metanotum rather dark in color. Sternum of thorax brownish; metasternum with some yellowish markings laterally. Legs: Fore legs rather short; coloration as in holotype; middle legs missing; hind legs colored as in holotype. Wings as in holotype.

Abdomen: Purplish-brown with a mid-dorsal, fine, pale line extending from tergites 1-7; 1-6 with heavy purplish markings laterally shading off into lighter coloration medially; tergites 1 and 2 darker than 3-6; 7-9 with about same coloration as 1 and 2. Tergites 3-5 have a heavy purplish-brown shading near the antero-median margin bordering the pale line, which becomes obsolescent on tergites 4 and 5. Median line on tergite 6 enlarges into a yellowish blotch; two large, lateral, pale areas extend anteriorly from posterior margin almost to the anterior margin. Tergites 1-9 with purplish-brown, posterior border, becoming rather intense on tergites 4-8. Tergite 2 with a large pale area extending from posterior border anteriorly almost to anterior margin; 1, 3-5 have smaller pale lateral spots. Tergites 7-9 somewhat blotched, 10 somewhat paler. Tergite 2 with a small, distinct, pale spine projecting postero-dorsally from the median line; spine approximately one-third the length of the tergite. Sternites purplish-brown; 2-8 with a purplish-brown dot at the mid-anterior margin. At the anterior margin there is a loop-like purplish pattern on either side of mid line. Lateral flanges present on segments 1-9, folded under at the postero-lateral corners of all segments except 9 where they extend posteriorly and are as long as segment 10. Caudal filaments as in holotype.

VARIATION IN MALE PARATYPES: Purplish margin around pronotum complete; heaviest on lateral edges and postero-lateral angles. Abdominal tergite 2 with the purplish triangle at the postero-lateral corner somewhat more extensive than in holotype. Tergite 1 extensively colored with purplish brown leaving only small pale area at mid-line. Markings on tergites 7 and 8 may be more definitely triangular than in holotype. Sternites may have purplish cast; black streak at antero-lateral angles may extend to posterior margin. Loop-like markings on sternites of allotype may be seen on some males. Wing length 8-8.5 mm.

VARIATIONS IN FEMALE PARATYPES: Whitish markings on pleura. Postero-lateral white marks on tergites 3-5 present, as well as indications of a median pale line which is particularly well marked on tergites 1, 2, 5-8. Wing length 9.5-10.6 mm.

HOLOTYPE: Male imago (reared) preserved in alcohol. Decatur Co., Georgia, Mosquito Creek, April 5, 1953. Collected by L. Berner. In collection of Florida State Museum, University of Florida.

ALLOTYPE: Female imago (reared) preserved in alcohol. Liberty Co., Florida, Sweetwater Creek, April 14, 1951. Collected by L. Berner. In collection of Florida State Museum, University of Florida.

PARATYPES: 6 males, 5 females (reared). All specimens in collection of Florida State Museum, University of Florida. Decatur Co., Georgia, April 5, 1953, Berner (2 males, 1 female); Liberty Co., Florida, Sweetwater Creek, April 14, 1951, Berner (4 males, 4 females). Other distributional records from immatures are listed in *The Mayflies of Florida* (Berner, 1950).

***Heptagenia flavescens* Walsh**

The capture of a single adult male of this species constitutes the first record of the genus in Florida. While collecting at light in the town of Chattahoochee on the night of April 4, 1953, this specimen was taken along with a number of adults of *Stenonema exiguum* and *S. smithae*. It was a warm evening with little wind and the town was brightly lighted. The specimen of *H. flavescens* was collected at 8:45 p.m.

Previously, *H. flavescens* had been collected no farther south than Atlanta, Georgia, located on the Chattahoochee River, about 250 miles north of the point of capture of this specimen (Needham et al., 1935). The Chattahoochee River joins the Flint River to form the Apalachicola about one mile from the town of Chattahoochee.

***Baetisca* sp.**

A single young nymph of what appears to be a new species of this interesting genus was collected by Mr. William M. Beck, Biologist, Florida State Board of Health, at Black Creek, Clay County, Florida. The specimen was taken on November 26, 1951, from rather swift flowing, deep water where it was attached to an anchored log.

The nymph resembles that of *B. rogersi* Berner, but lacks the serrations on the margins of the mesonotal shield, the lateral projections anterior to the lateral mesonotal spines, and the mid-dorsal tubercles on the posterior abdominal segments.

***Baetisca obesa* (Say)**

On January 15, 1952, Mr. Beck captured some young nymphs of *Baetisca* which proved to be a new record for Florida. Although the specimens are decidedly immature, they closely resemble *B. obesa* and I am placing them in that species. The nymphs were collected from the Withlacoochee River at the Florida state line north of Madison, Madison County. The river is deep here and the current has a moderate flow. The specimens were found clinging to vegetation that had fallen into the water at the edge of the stream.

Needham et al. (1935) record *B. obesa* from Sandy Creek, Georgia, Michigan, Indiana, and New Hampshire. In addition, Burks (1953) lists the species from Illinois, Manitoba, and Wisconsin, and notes that it develops in cool, fairly rapid streams, certainly very different in character from the Florida river from which the nymphs were taken.

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NEOTROPICAL MISCELLANY NO. VI
NEW GENUS AND SPECIES OF MALLOPHAGA

M. A. CARRIKER, JR.
Apartado Nac. No. 82, Popayan, Colombia

SUBORDER ISCHNOCERA

Genus *Fulicoffula* Clay and Meinertzhagen

In the new *Checklist of the Mallophaga* by Hopkins and Clay, eight species are included in this genus, one doubtfully (*Lipeurus volsellus* Ewing, from *Aramides cajanea*), the description of which included no figure and the type of which has been mislaid.

The genotype of *Fulicoffula* is *Philopterus luridus* Nitzsch (= *Lipeurus luridus* of Denny) from *Fulica atra* Linn. I have not been able to examine specimens of the genotype, nor has there been published any enlarged figure of the apical segments of the female abdomen which are so characteristic of the genus.

In the characterization of the genus, Clay and Meinertzhagen say: "Head with large clypeal signature bearing a median longitudinal slot and with a striated anterior margin; antennae exhibiting sexual dimorphism; abdomen elongated with segment IX bifid in male and more deeply bifid in female, and partly flanked on each side by a pointed prolongation of segment VIII."

I have a female of *F. longipila* (Kellogg), from *Fulica americana*, collected at Havana, Illinois, U.S.A., which agrees exactly with Kellogg's description, as far as it goes, and it has the characteristic abdominal segments VIII and IX of *Fulicoffula*.

Kellogg says: "Abdomen with segments gradually shortening from 1st. backward through the 7th., the 8th. slightly longer and 9th. deeply emarginate, the two acute points without hairs [they do have one strong bristle at tip]; from the dorsal face of the 8th. segment two very long hairs arise just inside the black lateral band; all segments wholly colored, *except posterior half of 8th.* [italics my own]; the transverse sutures uncolored, and indications of an uncolored median line on segments 3 to 6."

Note that his description of abdominal tergites is that of all females of the genus which I have seen. However, I have another female from the same host (*Fulica americana*), collected at Creston, Iowa, which is entirely different and agrees exactly with Kellogg's description and figure of his *Lipeurus picturatus* (also from *Fulica americana*) which Hopkins and Clay have, incorrectly, placed under the synonmy of *Fulicoffula*

longipila Kellogg, presumably because it somewhat resembles that species and because it came from the same host.

The generic position of this species is rather problematical. It certainly is not a *Fulicoffula* or an *Ardeicola* and agrees with no other. It not only has the abdominal tergites quite different from *Fulicoffula* but also the structure of the clypeus (in fact, nearly the whole head), and in addition it has *ten* abdominal segments, clearly defined, and the structure of the last two quite different from that of *Fulicoffula*. It lacks the curving, pointed extensions of pleurites VIII and the spines at the tips of the deeply bifurcated IX. There are, however, inconspicuous bars connecting IX and X which are somewhat analagous with those in *Fulicoffula* which connect VIII with IX, but they are extensions of pleurites IX instead of arising from the interior of VIII, as in *Fulicoffula* (see fig.).

The head, again, is entirely different from that of *Fulicoffula*, although there is a strikingly superficial resemblance. Among the generic characters of *Fulicoffula* we have the following: "Clypeal suture distinct and continued inward across dorsal surface of head and down the median line as a narrow suture as far as the anterior level of the mandibles."

In the present species the clypeal suture is *entirely absent*, the sides of the pre-antennary area being uninterrupted from trabeculae to end of clypeal bands, nor is the clypeal signature separated at all from the clypeal bands by a suture, the latter being wide and heavy and overlap the sides of the signature. The median clear suture of the clypeal signature opens posteriorly into a large clear space, extending backward to the mandibles and laterally to the edges of the clypeal bands which support the signature, more or less as shown in Kellogg's figure. In addition to the above difference there is a conspicuous, clear, dorsal suture running diagonally backward from the base of the trabeculae to the middle of the gular plate but not joining there.

Without the male sex of this species I hesitate to erect a new genus for its reception, but since four females were taken by Kellogg on two different specimens of the same host and I have a fifth female also from *Fulica americana*, there can be no doubt as to the authenticity of the host records for it. It is also clearly related to *Fulicoffula*, a genus found only on the Ralloidea, but cannot be considered as congeneric with that genus, so that it seems best to erect a new one for it, which I propose to call *Sakoskida*.

Genus *Sakoskida*[1] new genus

GENOTYPE: *Lipeurus picturatus* Kellogg. (Host: *Fulica americana.*)

The genus is distinguished by the characters of the head, the abdominal tergites, and the terminal segments of the female abdomen.

Elongated esthiopterine form with following characters: head with elongated clypeus and large clypeal signature, but with *no trace* of clypeal suture, the signature being overlapped laterally by the wide, heavy, continuous clypeal bands; clypeal signature divided longitudinally by a clear slit, ending anteriorly at the finely striated front of the signature (as in *Fulicoffula*), but opening posteriorly into a large clear area extending from signature to mandibles and from one clypeal band to the other.

Trabeculae small, triangular and uncolored; a narrow clear suture extends diagonally from base of trabeculae to the middle of the large gular plate, not quite meeting. Antennae thick and long, 1st., 3rd. and 5th. joints subequal and shortest. Thorax and legs as in *Fulicoffula;* abdomen long, slender and nearly parallel-sided, slightly wider at segments V and VI, and apparently with *ten* segments, narrowing abruptly at VIII and IX, with X parallel-sided, as wide as posterior margin of IX, and with posterior margin very deeply bifid (more than half the length of the segment), and with only a few very small setae. The tergites are much less deeply pigmented than the pleurites and consist of two rectangular sclerites, separated medially by a narrow clear space on segments I to VIII, and by a wider, clear band from pleurites on segments II to VIII. Tergite IX is continuous and more deeply colored, while X is uniformly the color of the divided tergites.

The structure of the head is very different from that of *Ardeicola,* which is the only other genus closely related, as well as the tip of the abdomen in the female.

Sakoskida picturata (Kellogg)

Fig. 10

Lipeurus picturatus Kellogg, 1896. Proc. Calif. Acad. Sci. (2) 6, page 121, pl. 8, figs. 1 and 2. (Host: *Fulica americana.*)

DIAGNOSIS.—The above characterization of the genus *Sakoskida* will suffice for a description of the species, in addition to that given by Kellogg, who apparently failed to observe that it had ten segments in the abdomen, calling the tenth the ninth, but his figure clearly shows ten, the same as my specimen. His description of the chaetotaxy is correct, as well as that of the thorax, while his figure is exceptionally good and his measurements are almost exactly the same as those of my specimen (see table below).

The junction of the head with the prothorax in this species presents a rather unique feature, there being no visible occipital margin to the head. Seemingly the anterior portion of the thorax is inserted *into* the head,

[1] From the Greek σχιξ (split) and σακος (shield).

where it is held in position by a condyle on each side of the base of the gular plate.

MEASUREMENTS OF THE FEMALE

	Length	*Width*
Body	2.23	.....
Head	.54	.326
Prothorax	.17	.23
Pterothorax	.29	.29
Abdomen	1.50	.35

Until now there has been no published record of the occurrence of any species of Mallophaga on *Heliornis fulica;* and since there has been considerable controversy over the nomenclatural position of this bird, it is with unusual interest that I can now record its Mallophagan parasite, and by discovering at the same time that the genus to which this parasite belongs *(Fulicoffula)* is a genus parasitic only on the Ralloidea, which adds rather unshakable proof of the very close relationship between the Rallidae and Heliornithidae.

While working on the new louse from *Heliornis* I searched carefully through my large series of *Ardeicola,* seeking a repetition of the unique abdominal structure peculiar to *Fulicoffula.* During this search I discovered a fine pair of lice with identical generic characters as that from *Heliornis* (but specifically different) collected on *Gallinula,* from Lake Junin, Peru. To add to my surprise, I also found a male and three females of another species of the same genus taken on *Laterallus albigularis* collected at widely separated places in Colombia. There seems to be no chance for error in these host records.

The three species of *Fulicoffula* described below are closely related, with the unique abdominal structure of the female practically identical, but all three easily separated by various specific characters. Did *Heliornis, Gallinula* and *Laterallus* have a common ancestor upon which lived this curious louse and which has persisted almost unchanged through the eons of time necessary for the development of three birds so entirely different from each other? Apparently that is just what has happened.

Laterallus is almost as different from *Heliornis* as *Gallinula* is from *Heliornis,* and yet this same genus of parasite, very little changed specifically, is found on all three birds, amazing proof of the stability of certain types of Mallophaga over unbelievably long periods of time, during which their hosts have become divided into very different genera and even families.

***Fulicoffula heliornis* n. sp.**

Figs. 1, 2, and 3

Types, male and female adults, from *Heliornis fulica*, collected by R. J. Newman on Río Huichihuayán, near ferry on road to Xilitla, San Luis Potosí, México, July 16, 1947 (types in coll. La. State Univ. Mus. Zoology).

DIAGNOSIS.—Excepting for the hyaline area between the clypeus and the mandibles and that surrounding the gular plate, the whole head is rather deeply pigmented and with the lateral bands heavily chitinized. The portion of the clypeus, anterior to the median, dividing hyaline suture, is covered with a series of fine, parallel, wavy, transverse lines (somwhat semicircular in shape), not pitted as in most *Ardeicola*, and with the frontal margin translucent. The clypeal signature is anchored posteriorly to the head by means of a slender, recurving band on each side which extends from the anterior mandibular condyle to the middle of the clypeal signature. The temporal bands (posterior to the eye) are corrugated along their inner margins, deeply pigmented, and with the adjoining area somewhat "tesselated." The chaetotaxy consists of several short setae at sides of clypeus and one longish hair on the temples.

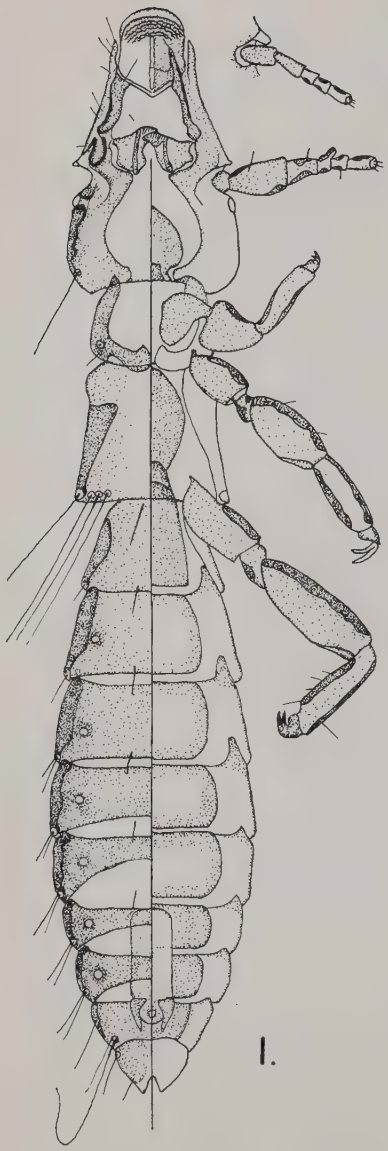
The lateral bands of the thorax are deeply pigmented, as well as the paratergals of the abdomen, but the tergites and pleurites are less deeply colored. There are four long pustulated hairs at each side of the pterothorax on the posterior margin; the acetabular bars, while strongly developed, extend but little beyond the margin of the pterothorax, but the socket in the rear coxae, in which their tips rest, is well marked. The legs are stout, with coxae and trochanter well developed, but the femora and tibiae are short. The abdomen in both sexes is widest medially, tapering to anterior and posterior ends in both sexes.

The male genital armature is also simple, consisting of short paramers, thickened basally and tapering to rather sharp points; a simple endomeral plate fills the space between the paramers. (Due to insufficient clearing, the genitalia cannot be studied as carefully as desirable.) The type series consists of the male holotype, female allotype and two male and three female paratypes. In addition, there are in the author's collection two females taken on the type host, one at Bonilla, Costa Rica, November 11, 1907, and the other at El Tingo, Peru, November 6, 1933.

MEASUREMENTS OF THE TYPES

	Male		*Female*	
	Length	*Width*	*Length*	*Width*
Body	2.30	.....	2.69	.....
Head { clypeus	.605	.185	.632	.185
Head { temples		.390		.412
Prothorax	.200	.273	.213	.285
Pterothorax	.340	.338	.347	.372
Abdomen	1.35	.453	1.69	.586
Antennae	.330	.07	.25	.043
Basal plate	.240	.087		
Paramers	.090	.090		

NOTE.—Measurements are in millimeters and are the extreme length of the segments from temples to frons and of entire thoracic segments, not at point of junction.



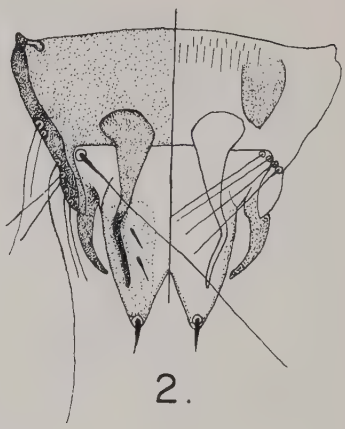


Figure 1. *Fulicoffula heliornis* ♂ (ex. *Heliornis fulica*)
Figure 2. *F. heliornis* ♀ tip of abdomen
Figure 3. *F. heliornis* ♂ genitalia

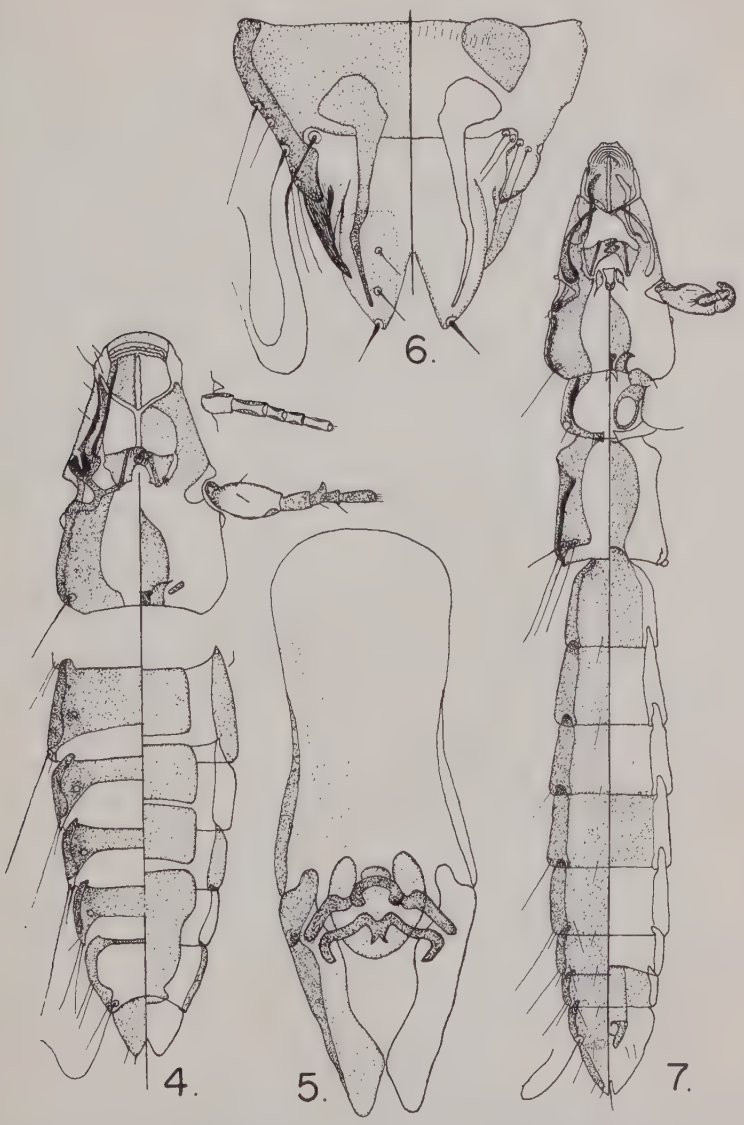


Figure 4. *Fulicoffula gallinula* ♂ (ex. *Gallinula chloropus garmani*)
Figure 5. *F. gallinula* ♂ genitalia
Figure 6. *F. gallinula* ♀ tip of abdomen
Figure 7. *Fulicoffula obstinata* ♂ (ex. *Laterallus albigularis albigularis*)

***Fulicoffula gallinula* n. sp.**

Figs. 4, 5, and 6

Types, male and female adults, from *Gallinula chloropus garmani* Allen, collected by the author on Lake Junin, Peru, April 15, 1930 (types in coll. of author).

DIAGNOSIS.—This species resembles very closely (except for the male genitalia) the preceding one, *F. heliornis*.

It is uniformly larger in most measurements, excepting that the head (at temples) is the same width as in the male of *F. heliornis* but slightly wider at the clypeus; the abdomen is wider in both male and female; segment VIII in female is wider, but the combined segments VIII and IX are equal in length; the shape of the bifurcated tip of IX is distinct (the tips wider basally); the long, curving, lateral spines are longer, as well as the two internal bars running from VIII backward to tips of IX (see fig.). The median row of fine setae along the anterior margin of VIII in female (ventrally) are much shorter and finer, while the entire chaetotaxy of VIII and IX is considerably shorter (see fig.), excepting the two dorsal spines on the bifurcated tip and the apical spines on IX, which are longer and thicker. The tergites on segments V to VIII in the male are narrower, while the large pleurite covering VII and VIII seems to be of different shape (this plate not clearly visible in *F. heliornis*).

The male genitalia is quite different from that of *F. heliornis*, the paramers being much longer and of distinct shape, while the endomeral plate is very much reduced in size, and there are two curiously-shaped structures lying over the endomeral plate, whose function I am at a loss to explain (see figure). The species is represented only by the male holotype and female allotype.

MEASUREMENTS OF THE TYPES

	Male		*Female*	
	Length	*Width*	*Length*	*Width*
Body	2.59	-----	2.97	-----
Head { clypeus	-----	.190	-----	.195
Head { temples	.620	.390	.640	.367
Prothorax	.217	.285	.220	.293
Pterothorax	.370	.393	.380	.391
Abdomen	1.53	.415	1.90	.542
Antennae	.359	.077		
Basal plate	.25	.10		
Paramers	.132	.10		

***Fulicoffula obstinata* n. sp.**

Figs. 7, 8, and 9

Types, male and female adults, from *Laterallus albigularis albigularis* (Lawrence), collected by the author at Acandí Chocó, Colombia, January 2, 1950 (types in U. S. Nat. Mus.).

DIAGNOSIS.—Whole insect much more slender than either *F. heliornis* or *F. gallinula*, with head much narrower, clypeus longer, and with its sup-

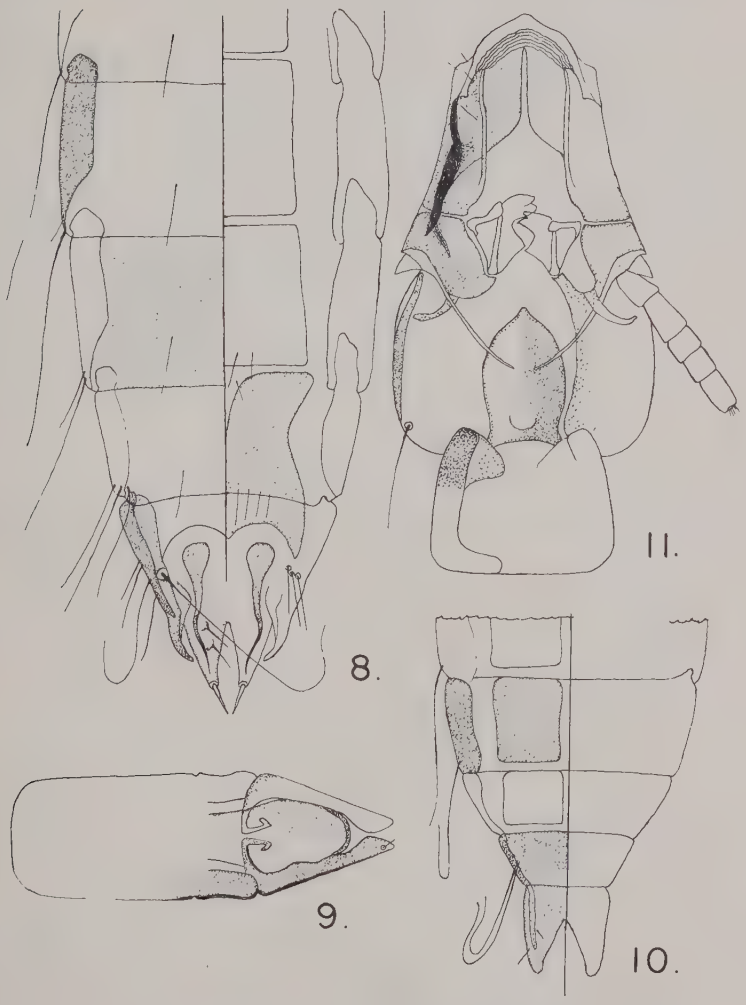


Figure 8. *F. obstinata* ♀ abdomen, V to IX
Figure 9. *F. obstinata* ♂ genitalia
Figure 10. *Sakoskida picturata* (Kellogg) ♀ tip of abdomen
Figure 11. *S. picturata* (Kellogg) ♀ head and prothorax

porting bands differently shaped, as well as the lateral clypeal bands (see fig.). Pharyngeal gland and sclerite present, although very small (obsolete in *F. heliornis* and *F. gallinula*); gular plate very long.

Prothorax longer than wide in male, as wide as long in female; abdomen more slender in both sexes; paratergals wider and more heavily chitinized. The structure of tergites and sternites is not clear (due to insufficient clearing). The tergites seem to be entire in all segments of both sexes and cover practically the entire area of the segments, excepting VIII and IX in female and IX in male. The sternites in male also seem to be entire, being mostly superimposed by the tergites, but in female they are apparently median, being widely separated from the pleurites. The combined segments VIII and IX in female are much smaller than in the other two species, but in all other respects are almost identical, even to the chaetotaxy.

The male genitalia is much smaller, with shorter, narrower basal plate and narrower at base of paramers, but the shape and length of paramers are very close to those of *F. heliornis*, except that their tips are broadened as in *F. gallinula;* the endomeral plate is not clearly visible and its details impossible to delineate. The species consists of the male holotype, the female allotype and another female taken at Santana, Santander N., Colombia, September, 1949.

MEASUREMENTS OF THE TYPES

	Male		*Female*	
	Length	*Width*	*Length*	*Width*
Body	2.07	.....	2.39	.....
Head { clypeus	.....	.120	.....	.120
Head { temples	.488	.270	.51	.293
Prothorax	.160	.224	.160	.220
Pterothorax	.285	.260	.293	.293
Abdomen	1.17	.27	1.487	.391
Antennae	.28	.057	.195	.032
Basal plate	.132	.07		
Paramers	.085	.068		

A NEW SPECIES OF *BOTHYNOTUS* FROM FLORIDA (HEMIPTERA: MIRIDAE)

JOSÉ C. M. CARVALHO[1]
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Studying specimens of Neotropical Miridae in the collection of the United States National Museum, the author found a new species from Florida herewith described and figured. It belongs to the genus *Bothynotus* Fieber of the tribe Clivinemini, subfamily Deraeocorinae.

Bothynotus Fieber, 1864

Bothynotus Fieber, 1864. Wien. Ent. Monats. 8: 76.

Neobothynotus Wirtner, 1917. Ent. News 28: 33; Bergroth, 1920. Ann. Soc. Ent. Belg. 60: 69 (as synonym).

TYPE SPECIES: *Phytocoris pilosus* Boheman, 1852; palaeartic.

OTHER SPECIES IN THE GENUS: *B. modestus* (Wirtner, 1917) (Ill., Pa., Fla., Md., Ohio, Kans.); *B. barberi* Knight, 1933 (Ariz.); *B. johnstoni* Knight, 1933 (Miss., Ga.); *B. kiritschenkoi* Lindberg, 1934 (Asia).

Bothynotus albus n. sp.

(Fig. 1)

Characterized by its small size, color of hemielytra, and male genitalia.

MALE: Length 2.8 mm., width 1.2 mm. *Head:* length 0.2 mm., width 0.6 mm., vertex 0.39 mm. *Antennae:* segment I, length 0.1 mm.; II, 0.7 mm.; III, 0.3 mm.; IV, 0.3 mm. *Pronotum:* length 0.6 mm., width at base 1.1 mm.

Color: Castaneous with reddish head and whitish hemielytra; antennae, pronotum and scutellum, cuneus, veins of membrane, longitudinal line on commisure of hemielytra and along upper portion of veins, legs and underside of body, castaneous to dark brown; head reddish; corium, clavus, embolium and membrane, whitish translucent; legs and mesosternum showing a reddish tinge on high magnification.

Small species, erectly pilose, eyes very small, distant from pronotum by a space equal to length of eye, first two antennal segments noticeably incrassate, third and fourth very slender, veins of membrane thick, the apical angle pointed externally, scutellum with two median excavations.

Genitalia: Left clasper pointed, finger like, swollen at base, curved ventrad. Right clasper very small, rounded apically (visible portion).

FEMALE: Unknown.

[1] John Simon Memorial Fellow 1953. Additional assistance was also granted by the Brazilian National Research Council.

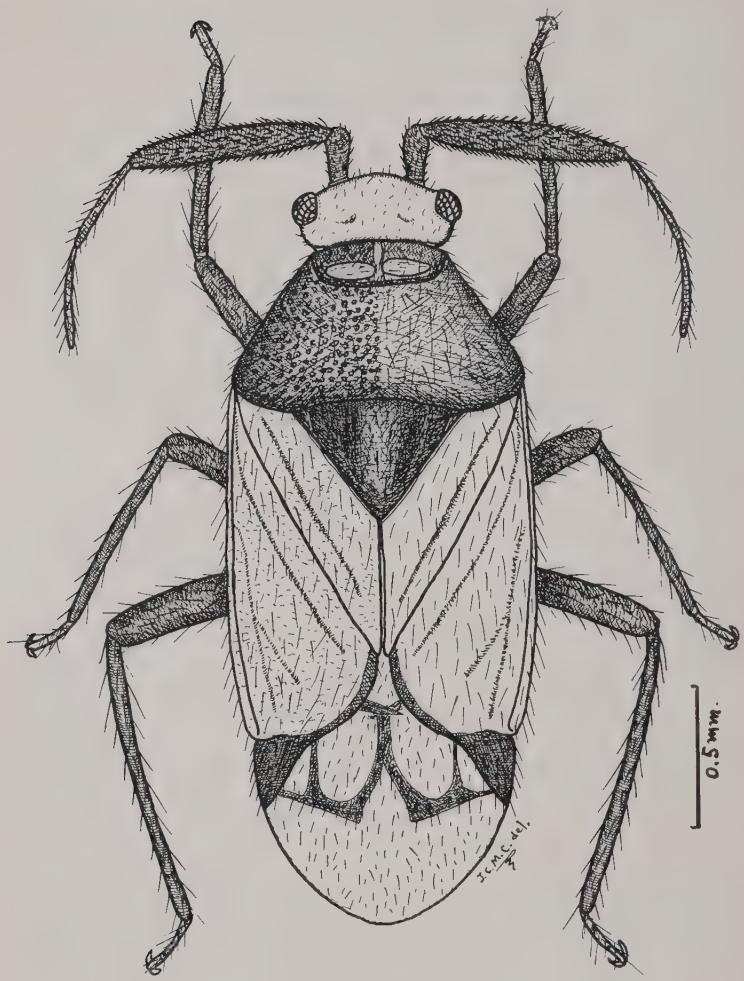

Figure 1. *Bothynotus albus* n. sp., male, holotype

HOLOTYPE: Male, Sarasota Co., Florida, 3.3:1931, W. L. McAtee col., in the collection of the U. S. National Museum, Cat. No. 61960.

This species differs from all others so far known in the genus *Bothynotus* Fieber, in the small size, in the structure of male genitalia and in the very characteristic whitish translucent color of the hemielytra, from which it takes the specific name.

The author wishes to acknowledge the use of laboratory facilities granted by the U. S. National Museum through Dr. Reece I. Sailer.

KEY TO THE SPECIES OF THE GENUS *Bothynotus* FIEBER [2]

1. Hemielytra whitish translucent ..... *albus* n. sp. (Florida)
   Hemielytra black or castaneous 2
2. Head, collar and calloused area red ..... *barberi* Knight (Arizona)
   Only head and collar reddish 3
3. Legs dark brown ..... *modestus* (Wirtner) (Ill. Pa. Fla. Md. Ohio. Kans.)
   Legs (at least apex of femur) reddish 4
4. Femora completely and first antennal segment, reddish ..... *pilosus* (Boheman) (Palaeartic)
   Only apice of femora reddish; first antennal segment castaneous ..... *johnstoni* Knight (Miss. Ga.)

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[2] *Bothynotus kiritschenkoi* Lindberg, 1934, runs to *pilosus* (Boheman) in this key.

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NOTES ON FLORIDA ODONATA, INCLUDING ADDITIONS TO THE STATE LIST[1]

MINTER J. WESTFALL, JR.
Department of Biology, University of Florida

In 1930 Dr. C. F. Byers published *A Contribution to the Knowledge of Florida Odonata*. It contained an annotated list of the species then known from Florida. Since that time various authors, including Dr. Byers and myself, have published additions to this original list.

Recently, several species of Anisoptera have been collected in Florida for the first time. Several of the specimens listed were collected by Mr. William H. Cross during his study for the master's degree at Florida State University in Tallahassee. I identified some of the specimens for him and Mr. Cross has kindly requested that I include his records here. He plans later to publish his thesis in abbreviated form. I have several other specimens of uncertain identity and possibly representing new species. A report on them is being withheld until more specimens can be taken and further study of them made. I am including here some records of interest on other species taken in the state which extend the known season of flight. The eleven species reported for the first time are preceded by an asterisk.

If not mentioned otherwise, the specimens are in my collection. The abbreviations used for names of collectors are as follows:

EMD — Edward M. Davis
JAF — John A. Fluno
GKS — G. Kenneth Scudder
MJW — Minter J. Westfall, Jr.

Tachopteryx thoreyi Hagen. I have a female of this species which was taken April 3, 1949, when it flew into an open window of Science Hall on the University of Florida campus in Gainesville at night.

Cordulegaster fasciatus Rambur. ALACHUA CO.—Gainesville: 1♀, MJW, 6/20/48.

**Cordulegaster sayi* Selys. The types of this species were taken in Georgia and according to Muttkowski (1910) are in the British Museum. While I was examining the specimens of

[1] Research supported in part by a grant from the U. S. National Park Service.

Cordulegaster in the Cornell University collection three males of this species were found pinned. On the pins were labels which indicated they were taken in Lake City, Florida, one on March 28, 1897, the other two on April 14, 1896. The northern records of this species are in doubt because of past confusion in determinations.

Hagenius brevistylus Selys. ORANGE CO.—Wekiva River: 1♂, MJW, 5/13/39.

Dromogomphus spinosus Selys. ORANGE CO.—Rock Springs near Apopka: 1♂, MJW, 4/14/39—Wekiva River: 1♀, EMD, 11/11/38.

**Dromogomphus spoliatus* Hagen. The only specimen of this species known from Florida is a female taken by me in September, 1950. It was resting on the ground in a field about 100 yards from the Santa Fe River at the Alachua-Columbia County line where U. S. Highway 441 crosses the river. It has previously been reported from several southern states including Alabama, South Carolina and Tennessee.

Gomphus (Gomphurus) *dilatatus* Rambur. ORANGE CO.—Winter Park: 1♀, GKS, 3/6/38.

**Gomphus* (Gomphurus) *fraternus* Say. While working with the Cornell University collection I recorded a female labeled by Dr. Needham as this species taken at River Junction, Gadsden County, Florida, on April 9, 1927. After collecting the closely related *hybridus* in the same county, I questioned the validity of the *fraternus* record. The Cornell specimen has been misplaced and I have not been able to verify its identification. Previously *fraternus* has been reported from nearby states including Alabama, Arkansas, and Mississippi so its occurrence here is not unexpected.

**Gomphus* (Gomphurus) *hybridus* Williamson. Since this species was first described from Tennessee in 1902 it has not been reported again. On March 24, 1951, I was on a trip in northwest Florida with Mr. William H. Cross and Mr. Robert B. Cumming. At Sweetwater Creek in Liberty County a "club-tail" was seen to alight on the ground in front of us. I approached with a long-handled net but before I could get close enough to make the catch, the dragonfly moved on some little distance to alight on the ground again. This was repeated many times until the chase had led about a quarter of a mile. The dragonfly then disappeared. About two hours later and after

a little shower, I succeeded in capturing a specimen. It proved to be a male and when compared carefully with a paratype of *hybridus* seemed to be identical in all diagnostic characters. After writing this account of *hybridus*, I was collecting April 3, 1953, along the Apalachicola River at Chattahoochee in Gadsden County, Florida, when large numbers of this species were encountered. They were relatively easy to capture even with a short-handled net. In about a half hour ten males and four females were collected and many more could have been taken with a longer net or if additional time had been available. The specimens collected on April 3 are in the Florida State Museum collection.

**Gomphus brimleyi* Muttkowski. The identity of this species has been a problem for some time. Students, in looking at the figures of it in the original description, have been impressed with the close resemblance to the figures of *G. cavillaris* Needham, published in the same paper. A few years ago, before Dr. C. S. Brimley died, he sent a specimen labeled *brimleyi* to Dr. Needham at Cornell University while I was working with him on this genus. In photographing it, I saw immediately that the specimen did not agree with the figures of the type at all and Dr. Needham has since described it as a new species, *Gomphus diminutus*. In the spring of 1950 Mr. Cross collected several specimens of a small dark gomphine which aside from its smaller size, darker ground color and brighter contrasting yellow seemed to be *G. cavillaris* and was so reported in his thesis. One male and two females were reared from nymphs taken in sinks near Tallahassee. On March 25, 1951, while I was collecting with Mr. Cross and Mr. Cumming in northwest Florida, several hours were spent at Lake Mystic in Liberty County. There we encountered this small gomphine in numbers and collected many adults as well as nymphs and exuviae. A closer study at a later date revealed other differences from *cavillaris* and we were finally convinced that these were identical with the original *brimleyi* described from North Carolina. A specimen sent to Dr. Needham brought the reply that he also was of this opinion. Mr. Duncan Cuyler has recently sent me two male specimens of *brimleyi* which he collected in the type locality, at White Lake, Bladen County, N. C., April 22, 1952. They seem to be identical with our Florida specimens. On April 4, 1953, six additional males were taken at Mystic Lake, and they are in the Florida State Museum collection. We now have adults of this species

from northwest Florida collected from March 12 to April 27. The two species *brimleyi* and *cavillaris* need further intensive study. They are very similar and might be regarded as subspecies by some workers. A careful comparison of nymphs of the two species is still to be made, as well as a more critical study of adult characters.

Gomphus minutus Rambur. ORANGE Co.—Wekiva River: 1♂, JAF, 2/21/37—Maitland: 1♂, W. Atlee, 5/12/35.

Gomphus lividus Selys. On March 23 and 24, 1951, Mr. Cross, Mr. Cumming and I found the adults of this species to be very common on the hills around Sweetwater Creek in Liberty County. On March 25 we collected them in considerable numbers along the Chipola River below Scott's Ferry in Calhoun County. Many were taken in a recently timbered area back from the river along with *Gomphus minutus*, as well as in cleared areas near the river bank. April 4, 1953, two males were collected in Gadsden County, one 5 miles, the other 9 miles south of Chattahoochee. Both are in the Florida State Museum collection.

Gomphus (Arigomphus) *pallidus* Rambur. In the Cornell University collection there is a specimen of this species taken March 20 in Florida. The earliest date in my collection is March 22, 1938, when two males and two females were collected on the Kissimmee Prairie by Mr. E. M. Davis.

**Gomphus* (Stylurus) *ivae* Williamson. Mr. Cross collected a full-grown nymph at Sweetwater Creek in Liberty County, August 9, 1950. It emerged August 25 and proved to be a male which I identified as this species, first described from Georgia in 1932. To our knowledge this is the first time it has been taken in Florida. Mr. Cross again visited Sweetwater Creek September 2, 1951, and collected an exuvium and two teneral females. A male was also seen. Mr. Cumming has since brought a female to me. It was taken 5 miles east of Gainesville in Alachua County on October 6, 1951. The specimens taken by Mr. Cross are in his personal collection and he expects to describe the nymph soon. The female from Alachua County is in Mr. Cumming's collection.

**Gomphus* (Stylurus) *laurae* Williamson. On April 4, 1953, I collected a number of full-grown nymphs in a small, cold stream about 5 miles south of Chattahoocheee in Gadsden County. One male died April 27 while emerging but was identified as this species. Later two other males emerged on May 3 and May 10. These specimens are in the Florida State Museum

collection. The nymph of this species is still undescribed. Mr. Thomas W. Donnelly, who plans to describe the nymph, has sent me a reared specimen from a stream near Washington, D. C.

Gomphus (Stylurus) *plagiatus* Selys. Wekiva River: 1♂, EMD, 11/13/35, specimen pinned in the collection at Rollins College in Winter Park.

Progomphus alachuensis Byers. ORANGE CO.—Winter Park: 1♀, JAF, 8/8/35.

**Basiaeschna janata* Say. On the same expedition to Sweetwater Creek mentioned earlier, a stop was made just south of Scott's Ferry along the Chipola River in Calhoun County. There Mr. Cumming collected a female of this species on March 25, 1951. The next day a male was taken by Mr. Cross at Wewahitchka, Gulf County. The male is in Mr. Cross's collection, the female is in Mr. Cumming's collection.

Coryphaeschna ingens Rambur. SEMINOLE CO.: 1♀, GKS, 10/3/37. I have a record of a specimen, formerly in the Rollins College collection, taken February 12 in Florida, but it has apparently been given away in exchanges, so I am unable to furnish complete data.

Epiaeschna heros Fabricius. ORANGE CO.—Wekiva River: 1♀, EMD, 3/7/39.

Nasiaeschna pentacantha Rambur. ORANGE CO.—Wekiva River: 1♂, EMD, 3/2/39.

Triacanthagyna trifida Rambur. ORANGE CO.—Wekiva River: 1♂, EMD, 1/8/37.

Didymops floridensis Davis. ORANGE CO.—Winter Park: 2♂♂, Mr. Hugh C. Davis, 2/28/38.

Macromia taeniolata Rambur. ORANGE CO.—Wekiva River: 1♀, EMD, 11/11/38. In the Rollins College collection I once saw a specimen taken in Florida on April 26. This is the earliest record known to me, but the specimen has apparently been given away in exchange and I am unable to provide complete data.

Epicordulia regina Selys. ORANGE CO.—Wekiva River: 1♂, EMD, 3/23/35. COLUMBIA CO.—Santa Fe River: 1♂, MJW, 8/25/50.

**Neurocordulia molesta* Walsh. This "long lost" species proves to be rather widespread in its distribution. The aberrant nymph was described by Dr. Byers as *Platycordulia* by supposition, in part because of the presence of a strong frontal horn like that found in *Macromia*. Drs. Septima Smith and Robert

Hodges have reared this nymph in Alabama and found that the adult agrees perfectly with Walsh's description of the destroyed type. I have received nymphs from the Savannah River, the boundary line between Georgia and South Carolina. On April 3, 1953, I was collecting along the Florida side of the Apalachicola River near the Jim Woodruff Dam, which was under construction at Chattahoochee, Florida. On some bushes at the edge of the river I found seven nymphal skins of this species, thus establishing its occurrence in Florida. The specimens are in the Florida State Museum collection.

**Neurocordulia* sp. On May 12, 1941, I reared a male of this undescribed species from a nymph collected in Seminole County on March 21. A second specimen emerged and fell into the water of the rearing cage while I was away from home, and it is now represented only by fragments. Many nymphs have recently been taken in Hatchet Creek, near Gainesville, Alachua County, as well as a single nymph from Hogtown Creek near Gainesville. From these nymphs adults emerged as follows: ♀, June 1951; ♂, June 4, 1952; ♀, June 8, 1952; ♀, June 12, 1952. In addition I have many nymphs from near Lake Placid in Highlands County, and from Snake Run, Winter Park in Orange County. Mr. W. H. Cross has sent me four nymphs which he collected in Coney Branch at Fanlewwacissa Road, Jefferson County, Florida, February 24, 1951, also an adult female which he took at Beulah Pond, Aiken Co., South Carolina, July 18, 1952, when it flew to a light at 10:45 p.m. The habitat of the nymphs of this species seems to be very different from that of *N. virginiensis* Davis, as reported by Byers (1930) and described by Cross in his unpublished thesis. Instead of living on rocks in rather swift water, these are found in tangled masses of roots near margins of slow-flowing streams. They have been easy to rear in an aquarium without aerating the water. It appears to be a rather common species, judging from the number of nymphs found, though the adults in the past have not often been encountered. The nymphs of this species are distinguished from those of *virginiensis* by dorsal hooks of the abdomen which are much higher and differently shaped, being more flattened laterally and obtusely cultriform. There are even better characters in the head. The frontal shelf does not project so far forward as in *virginiensis* and is relatively smooth, whereas the shelf of *virginiensis* is studded with numerous denticles. In the new species the first segment of the antenna is

about as long as the third segment and projects well beyond the tip of the frontal shelf, whereas in *virginiensis* the first segment of the antenna is shorter than the third and does not nearly project to the tip of the frontal shelf. Recently I carefully examined reared specimens of both sexes of a new species of *Neurocordulia* which Drs. Smith and Hodges of Tuscaloosa, Alabama, are describing and I am convinced that mine are the same species, so am leaving to them the naming of this interesting dragonfly.

Somatochlora provocans Calvert. LEON CO.—Bradford Brook, Silver Lake Road: 1♀, W. H. Cross, 8/30/51 specimen in collection of Mr. Cross.

Tetragoneuria stella Williamson. ORANGE CO.—Winter Park: 1♂, JAF, 2/3/35 specimen pinned in the Rollins College collection.

Cannacria gravida Calvert. ORANGE CO.—Winter Park: 1♀, JAF, 11/15/35. I have a note that a specimen in the Cornell collection was taken in Florida on March 29. A note I made while studying the Rollins College collection indicates that a specimen was taken in Florida November 17, but it has since been given away in exchange so the complete data are not available.

Celithemis fasciata Kirby. There is a specimen in the Cornell University collection taken in Florida on May 5. This is the earliest date of capture known to me.

Celithemis ornata Rambur. SEMINOLE CO.—1 teneral ♀, JAF, 1/24/37.—Longwood: 1♂, EMD, 12/3/34.

**Celithemis verna* Pritchard. A single male of this species was reared by Mr. Cross from a nymph collected at a small pond just north of Tallahassee on April 7, 1950. It emerged April 18, 1950, and was identified by me. He also collected a female near Lake Bradford, Tallahassee, on April 9. Mr. Cross has the specimens. This species has been collected in a number of places since its description in 1935 from Oklahoma and Georgia. I reported it for the first time from North Carolina in 1942 and told something of its habits as observed there. It has also been reported from Kentucky by Mr. Carl Cook.

Ladona deplanata Rambur. ORANGE CO.—10 miles west of Orlando: 1♂, EMD, 1/4/35.

Libellula auripennis Burmeister. Kissimmee Prairie: 1 teneral ♀, EMD, 2/23/35. SEMINOLE CO.: 1♂, 1♀, GKS,

10/3/37. I have a record of a specimen formerly in the Rollins College collection taken December 3 in Florida, but it is not now available for detailed data.

Libellula axilena Westwood. ORANGE CO.—Orlando: 1♀, D. F. Berry, 3/26/36. My notes show that a specimen taken March 25 in Florida was studied in the Rollins College collection but that it is no longer available. I find that the original spelling by Westwood of this species name is as given here, not with a second "l" as it has appeared so often recently. Ris also used the original spelling in his monumental work on the Libellulines.

Libellula pulchella Drury. Dr. Byers in 1930 placed this species in Part III of his annotated list as "said to occur in Florida or immediate neighborhood, the records for which, owing to one reason or another, seem questionable." A male was collected by Mr. Cross at Lake Jackson in Leon County and a pair was taken September 30, 1950, near Wakulla Station in Wakulla County. The species is thus definitely known to occur in Florida. The specimens are in Mr. Cross's collection.

Tramea binotata Rambur. DADE CO.—Royal Palm Park: 1♂, Douglas Riggs, 12/29/36. Dr. Byers (1930) listed this species in his Part II "from reliable literature records only." The reference was to Hagen's paper of 1875 with a record from Key West under the name *insularis*, which is a synonym of *binotata*. Dr. Calvert (1906) repeated this record and mentioned another specimen from Sanford in the Museum of Comparative Zoology collection, again under the name *insularis*. The Dade County record is the only other known to me.

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MINUTES OF THE THIRTY-SIXTH ANNUAL MEETING OF THE FLORIDA ENTOMOLOGICAL SOCIETY

The thirty-sixth annual meeting of the Florida Entomological Society was held in the ballroom of the McAllister Hotel, Miami, during September 10th and 11th, 1953. The meeting opened at 10:00 A.M., September 10th with the presidential address given by Dr. J. T. Griffiths. Twenty-two papers were presented before the Society, including three invitational papers. The invitational papers were: "Agricultural Contributions to the Democratic Efforts in Southeast Asia," by John T. Creighton; "Plans for Expanded Mosquito Control and Research in the State of Florida," by John A. Mulrennan; and "Migrations of Salt-marsh Mosquitos," by Maurice W. Provost. Over one hundred members attended the meetings.

A most enjoyable hospitality hour was provided by Industry followed by a banquet at the McAllister Hotel. Dr. Gray Butcher acted as toastmaster. Entertainment during the banquet was also provided for by contributions from Industry.

The business meeting was called to order by President Griffiths at 4:25 P.M., September 10th. Mr. Mayeux moved we dispense with the reading of the minutes of the 1952 meeting since they had been published in Volume 35, No. 4 of the FLORIDA ENTOMOLOGIST. Dr. Butcher moved they stand as published. The motions passed. Dr. Griffiths called for a report of the Committee to Study Possibilities to Stimulate Interest in Forming a Florida Pathological Society. Mr. W. L. Thompson presented the report which follows:

> Just before the last meeting of the Station Pathologists, your chairman of this committee suggested to Dr. R. F. Suit, a member of the Citrus Station staff, that he get an expression from the pathologists in regard to a joint meeting of the two groups. He reported that in general the pathologists were in favor of a joint meeting with the Entomological Society. In the discussion it was suggested that the pathologists could have their own meeting on the first day of the Entomological Society meeting and on the second day a joint meeting could be held, or continue separate meetings, as the two societies decide. There was also some discussion on holding the meeting at the same place but just before the Horticultural Society meeting, but not all members were in favor of it. It was also suggested that the meeting be held in the central part of the state. After attending an Annual

Meeting of the Entomological Society the pathologists may form an opinion as to whether they care to have a similar organization.

Your Committee suggests that in 1954, our Society invite the pathologists to meet at the same time and place, and on the second day a joint meeting can be held. Such a meeting would be beneficial to both groups and furthermore, it would save some travel expenses, especially for Station members.

However, your committee also recommends that each group maintain separate organizations, officers and publications.

Signed: W. L. THOMPSON
R. K. VOORHEES
J. C. RUSSELL

In the discussion that followed the reading of this report, Mr. Mayeux suggested that the Society work towards leading the Pathologists into forming a Pathological Society. He also suggested we extend a special invitation to the plant pathologists to attend our next meeting. At the suggestion of Mr. Thompson, the President delayed calling for a vote on the Committee's report until the business meeting to be held on September 11th.

President Griffiths called for the Treasurer's report. Dr. L. C. Kuitert presented the following report due to the absence of Mr. Hunter, who was unable to attend the meetings because of illness at home.

Dr. Kuitert who was chairman of the Auditing Committee then made the following report: It is my honor and privilege to report that the auditing committee found the report of the Business Manager in good order and that the records were found to be correct. The report of the auditing committee was accepted by the Society.

President Griffiths opened the floor to new business. The President brought up the proposed amendment of the By-Laws of the Constitution to increase the annual dues of the Society. A notice of this amendment had been sent to all members on July 14th, 1953, as required by the Constitution. The amended article of the By-Laws which reads as follows, was adopted upon the motion of Dr. John Wilson.

ARTICLE IV — DUES

Section 1.—The annual dues of active members shall be $3.00, except for University or High School students who may affiliate with the Society by the payment of $1.25. At least three-fourths of said dues shall be

used for a year's subscription to the FLORIDA ENTOMOLOGIST. Honorary members shall be exempt from payment of dues. Dues shall be paid annually in advance.

President Griffiths reported that the amendment of Article III of the Constitution making possible Sustaining Members, as proposed in the letter of July 14th, could not be acted upon this year because the requirements for amending the Constitution had not been met. He proposed that the incoming President appoint the necessary special committee to consider this amendment and report back to the Society at the 1954 meeting for action as required by the Constitution.

REPORT OF THE TREASURER-BUSINESS MANAGER
FOR THE YEAR ENDING AUGUST 31, 1953

Receipts:

Balance on Hand, October 1, 1952	$ 214.23	
Residue from Registration Fees, Fort Pierce	66.24	
From Membership Dues	598.00	
Residue from Hospitality Fund	123.00	
From Subscriptions to the FLORIDA ENTOMOLOGIST	142.88	
From Authors for Reprints and Plates	177.08	
From Advertisements in the FLORIDA ENTOMOLOGIST	701.50	
From Refund from U. S. Postmaster	27.51	
From Sales of Back Numbers	17.75	
Total		$2,068.19

Expenditures:

To Pepper Printing Company	$1,281.44	
To University of Florida Duplicating Department	41.96	
To U. S. Postmaster for Stamps, etc.	108.64	
To Bank Service Charges	8.32	
Refunds to Subscribers	6.00	
To Miscellaneous Printing, Typing, Memo	20.93	
Office Supplies	28.19	
Dr. Berner for Stamps, Student Help, etc.	20.00	
Telephone Bills Incurred in Arranging Meeting	11.50	
Programs for Last Meeting	18.66	
Advertisement in *Agricultural Chemicals*	5.60	
To Mrs. Claude Adams for Steno Work	25.00	
Total		$1,576.22

Balance on Hand, August 31, 1953 ..... $ 491.97

Respectfully submitted,
WILLIAM P. HUNTER
Treasurer-Business Manager

The business meeting of September 10th then adjourned at 4:40 P.M.

President Griffiths called the business meeting of September 11th to order at 11:15 A.M. The first order of business was the report of the Resolutions Committee. The Committee consisting of Mr. R. O. Kirkland, W. A. Simanton, and F. S. Chamberlin submitted the following resolutions:

Be it Resolved by the Florida Entomological Society:

1. That the Society extend its sympathies to the family of Dr. D. C. Thurman who was called to his reward while serving his country on a foreign mission in Thailand.
2. That the Society extend its sympathy to Dr. John T. Creighton for the death in his family, and its regrets that he was unable to attend this year's meeting and present his invitational paper in person.
3. That the Society express its appreciation to the Committee on Arrangements for its excellent handling of the registration, meeting place and program; also making possible a most enjoyable hospitality hour and banquet. The Committee consisted of F. Gray Butcher, Chairman; John M. Bellows, Entertainment; D. O. Wolfenbarger, Exhibits and Displays; and Walter H. Thames, Jr., Program.

The resolutions committee suggests: That hereafter local Arrangements Committees refrain from securing nearby hurricanes which require the installation of hurricane protection construction work while our meeting is in progress.

Dr. John Wilson moved the resolutions be adopted as read provided sympathies of the Society be extended to Mr. W. P. Hunter for the illness in his family. The resolutions were passed by the Society as amended.

President Griffiths called for a motion from the Committee to Study Possibilities to Stimulate Interest in Forming a Florida Pathological Society. Mr. W. L. Thompson, Chairman of the Committee made the following motion: I move that in 1954 the Experiment Station Pathologists be invited to participate at the annual meeting of the Florida Entomological Society and that the incoming president appoint a committee to make such arrangements between the two groups for a joint meeting. In the discussion that followed the making of this motion Dr. Symington brought up the point of how the Pathologists would be notified. Mr. Hayslip asked if people working on weed-

killers would be invited with the pathologists. Mr. Mayeux commented that the pathologists and entomologists were closely related and that they had many common problems, and that the pathologists meeting with us would be advantageous to both groups. Mr. Thompson said the Committee appointed by the President would work out the details. The motion passed.

President Griffiths called for a report of the Membership Committee. Dr. L. A. Hetrick, Chairman of the Committee, reported that 31 members had joined the Society during the last year and that 15 members had been dropped for non-payment of dues and that no Honorary Members had been proposed to the Committee for action of the Society.

President Griffiths asked the members present to be active in securing new members for the Society. He brought up the subject of printing the papers presented before the Society and urged that all papers be sent to the Editor for publication. He said he wanted to thank Dr. Butcher and his committee for their efforts in making this a successful meeting. He mentioned a letter from Mr. Van Horn concerning meeting dates, and brought out the point that this year's meeting date conflicted with the National Agricultural Chemicals meeting which always meets on the first weekend after Labor Day. He then called for the report of the Nominating Committee, consisting of Herman S. Mayeux, Chairman, Herbert Spencer and George Dekle. The committee suggested the following names:

President	D. O. Wolfenbarger
Vice President	F. Gray Butcher
Secretary	Milledge Murphey, Jr.
Editor	Lewis Berner
Asst. Editor	L. C. Kuitert
Executive Committee Member	John W. Wilson

President Griffiths called for nominations from the floor. Dr. Kelsheimer moved the Secretary be instructed to cast a unanimous ballot for the slate as proposed by the Nominating Committee. The motion passed.

The new President was escorted to the stand. Dr. Wolfenbarger thanked the Society for the honor that had been bestowed on him.

The business meeting was adjourned at 12:05 P.M.

MILLEDGE MURPHEY, JR.
Secretary

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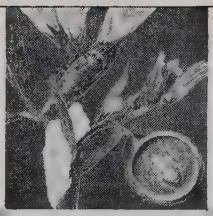

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millipeds
mole cricket
Mormon cricket
okra caterpillar
onion thrips
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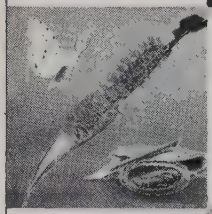
pear psylla
pear thrips



cotton bollworm
cotton fleahopper
cotton leafworm
cowpea aphid
cowpea curculio
cucumber beetles
cutworms
darkling beetles
fall armyworm

southern corn rootworm
spittlebugs
stink bugs
strawberry crown bore
strawberry leaf roller
strawberry weevil
suckfly
sugar beet webworm
sweetclover weevil

bollworm
cabbage caterpillars
cattle lice
chiggers (on vegetation)
chinch bugs
clover seed chalcid
corn earworm
corn lantern fly
cotton aphid

pecan weevil
pepper weevil
pod weevil
pollen beetle
plum curculio
rapid plant bug
salt-marsh caterpillar
serpentine leaf miner
southern armyworm

field cricket
flea beetles
fleece worm
grasshoppers
goat lice
hog lice
horn fly
leafhoppers
little fire ant

tarnished plant bug
ticks
tomato fruitworm
tomato hornworm
tomato pinworm
velvetbean caterpillar
western cotton plant bug
webworms
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